Remarks

The present amendment responds to the final Official Action dated November 18, 2003. The Official Action rejected claims 1-12, 16 and 17 under 35 U.S.C. § 103(a) based on Crochiere et al. U.S. Patent No. 5,664,011 (Crochiere) in view of Golla et al. U.S. Patent No. 5,724,395 (Golla). The Official Action also rejected claims 13-15 under 35 U.S.C. § 103(a) based on Crochiere and Golla in view of Maulik et al. U.S. Patent No. 6,260,053 (Maulik). The Official Action further rejected claim 18 under 35 U.S.C. § 103(a) based on Crochiere and Golla in view of Walker et al. U.S. Patent No. 5,570,423 (Walker). Claims 19-22 were indicated to be allowable. The foregoing grounds of rejection are addressed below following a brief discussion of the present invention to provide context. Claims 1-18 have been amended to be more clear and distinct. Claims 1-22 are presently pending.

The Present Invention

The present invention provides for canceling echo/near-end crosstalk in a bi-directional data communications system by partitioning echo/near-end-crosstalk components such that a) a first portion is processed by a first FIR filter having a data path identical to a first bit resolution, and b) a second portion having a data size exceeding the bit width of the first FIR filter is processed by a second FIR filter having a data path identical to a second bit resolution. The first bit resolution is determined from a predetermined number of a plurality of echo/near-end-crosstalk (E/N) signals having a lowest amplitude. The second bit resolution is determined by subtracting the first bit resolution from a bit resolution of a single signal from a plurality of E/N signals having a highest amplitude.

The Rejection of Claims 1-12, 16 and 17

Claims 1-12, 16 and 17 were rejected under 35 U.S.C. § 103(a) based on Crochiere in view of Golla. Applicants respectfully request that this rejection be withdrawn in view of the discussion below.

Claim 1 has been amended to be more clear and distinct. Claim 1 now affirmatively recites that the data signal has echo/near-end-crosstalk components and that the first and second finite impulse response filters provide first and second filter output values. Further with regard to claim 1, the second portion of the partitioned data signal is not required to have bits having a data size greater than the bit width of the first finite impulse response filter.

Crochiere discloses an echo canceller having adaptive and non-adaptive filters. Crochiere, col. 3, lines 4-25. Crochiere's filters 126 and 128 are arranged in cascade with filter

126 in the foreground and filter 128 in the background. The word "cascade" in this context means something that is arranged or occurring in a series or in a succession of stages, so that each stage derives from or acts upon the product of the preceding stage. The filter 126 provides the actual echo cancellation for echo canceller 110 while filter 128 attempts to cancel whatever echo is not canceled by filter 126. Crochiere, col. 5, lines 5-9 and 46-60. The output from adaptive filter 128 is used by the controller 134 to modify the filter coefficients of non-adaptive filter 126. Crochiere, col. 5, lines 10-36. The output from adaptive filter 128 is not used to provide the actual echo cancellation.

By contrast, claim 1 according to the present invention recites that data are partitioned and processed by first and second filters. Such an arrangement is not the cascade arrangement of Crochiere. This was recognized by the Official Action which admits on page 2 that "...Crochiere does not mention...means to partition the input data signal such that a portion of the input signal is processed by each FIR filter..."

Furthermore, figs. 2 and 3 of Crochiere both show non-adaptive filter 126 and adaptive filter 128. Both of filters 126 and 128 are described as having an "impulse response." However, Crochiere fails to disclose that either of such filters may or should be a finite impulse response filter. Fig. 1, labeled "prior art", shows an adaptive filter 30 having a finite impulse response (FIR). Crochiere, col. 3, line 66. However, Crochiere fails to disclose that adaptive filter 30 of Fig. 1 is used as adaptive filter 128 of Fig. 2 or 3. The Official Action accordingly admits at page 2 that "...Crochiere does not mention...a second FIR filter...". Thus, Crochiere fails to disclose the echo/near-end-crosstalk cancellation system of claim 1, which requires two finite impulse response filters.

As the Official Action tacitly admits, Golla fails to disclose the system defined in claim 1. For example, Golla fails to disclose the application of Golla's method, or the inclusion in Golla's architecture, of a data partitioning means for partitioning a data signal having echo/near-end-crosstalk components such that a first portion of a partitioned data signal is processed by the first finite impulse response filter to provide a first filter output value, and a second portion of the partitioned data signal is processed by the second finite impulse response filter to provide a second filter output value.

One of ordinary skill in the art would not combine the teachings of Crochiere and Golla. Fig. 2 of Crochiere shows that filters 126 and 128 are arranged in an input cascade, with filter 126 in the foreground and filter 128 in the background. The output from adaptive filter 128, unlike the output from non-adaptive filter 126, is not added to the output port 122 to provide the actual echo cancellation. Golla teaches that the outputs of two filters are summed. Doing so is incompatible with the cascade arrangement of Crochiere. Therefore, applicants respectfully

object to the attempted combination of Crochiere and Golla as contrary to the teachings of these references.

For the foregoing reasons, Crochiere and Golla, taken alone or in combination, fail to disclose an echo/near-end-crosstalk cancellation system for a bi-directional data communications system as defined in exemplary claim 1. Since claims 2-12, 16 and 17 depend from an allowable independent claim they too are allowable over the cited references.

The Rejection of Claims 13-15

Claims 13-15 were rejected under 35 U.S.C. § 103(a) based on Crochiere and Golla in view of Maulik. Applicants respectfully request that this rejection be withdrawn in view of the discussion below.

Maulik discloses a scalable finite impulse response filter having at least one linear phase decimation-by-two processing element. Maulik, col. 1, lines 46-48. Maulik is cited by the Official Action at page 5 solely for its disclosure regarding direct and transpose form finite impulse response filters. The discussion above with regard to Crochiere and Golla is repeated here and is dispositive, and the discussion of Maulik is moot.

The Rejection of Claim 18

Claim 18 was rejected under 35 U.S.C. § 103(a) based on Crochiere and Golla in view of Walker. Applicants respectfully request that this rejection be withdrawn in view of the discussion below.

Walker discloses a method of providing adaptive echo cancellation in a transmission system having an echo canceller with a finite impulse response filter. Walker, col. 2, lines 43-45. Walker is cited by the Official Action at page 5 solely for its disclosure regarding floating and fixed-point numbers. The discussion above with regard to Crochiere and Golla is repeated here and is dispositive, and the discussion of Walker is moot.

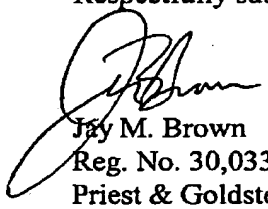
Other Amendments; Allowable Subject Matter

Claims 2-18 have been amended with regard to grammatical and typographical matters. Applicants acknowledge with appreciation the indication that claims 19-22 are allowable.

Conclusion

All of the presently pending claims, as amended, appearing to define over the applied references, withdrawal of the present rejection and prompt allowance are requested.

Respectfully submitted,



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